

## CLAIMS

I/We claim:

1. A method for modeling utilization of healthcare resources in a target period based on a plurality of provider claims from a base period maintained for a member of a healthcare plan, the method comprising:
  - calculating a burden of illness for the member based on the plurality of provider claims, wherein the burden of illness is a number; and
  - computing a score for the member based on the burden of illness and at least one explanatory variable.
2. The method of claim 1 wherein the provider claims include medical claims and pharmacy claims.
3. The method of claim 1 wherein the plurality of provider claims include only pharmacy claims.
4. The method of claim 1 wherein the provider claims include only medical claims.
5. The method of claim 1 further including, prior to the calculating step, the step of extracting a data set from the plurality of provider claims, the data set including only information, from the base period, from the plurality of provider claims relevant to healthcare utilization during the target period, and further wherein the calculating step is based on the data set.
6. The method of claim 5 further including, after the extracting step, the

step of cleaning the data set to remove correct obviously erroneous information by comparing categories of the data set to acceptable values.

7. The method of claim 5 further including, after the extracting step, the step of placing a plurality of pharmacy codes, representing a prescribed medication, into a plurality of therapeutic pharmacy classes.
8. The method of claim 7 wherein the plurality of therapeutic pharmacy classes are GC3 classes.
9. The method of claim 7 wherein the burden of illness number is derived by summing a plurality of weights corresponding to each of the plurality of therapeutic pharmacy classes present for the member.
10. The method of claim 7 wherein the burden of illness number is derived by summing a plurality of weights corresponding to each of the plurality of therapeutic pharmacy classes present for the member and a plurality of weights corresponding to relevant combinations of therapeutic pharmacy classes present for the member.
11. The method of claim 5 further including, after the extracting step, the step of placing a plurality of disease codes from the medical claims, representing diseases treated, into a plurality of disease classes.
12. The method of claim 11 wherein the disease classes are CCG classes.
13. The method of claim 11 wherein the disease classes are CCG

categories.

14. The method of claim 11 wherein the burden of illness number is derived by summing a plurality of weights corresponding to each of the plurality of disease classes present for the member.
15. The method of claim 14 wherein the plurality of weights is the average incremental cost associated with each of the plurality of disease classes associated with the group for a benchmark population.
16. The method of claim 1 further including, prior to the calculating step, the steps of determining the presence of a plurality of medical episodes and placing the plurality of claims data into a plurality of groups based on a medical episode.
17. The method of claim 16 wherein the plurality of groups are Clinical Care Groups.
18. The method of claim 16 wherein the pharmacy claims in the plurality of claims data are assigned to one of the plurality of groups based on a relationship to corresponding medical claims indicating the presence of the medical episode.
19. The method of claim 16 wherein the plurality of claims are only medical claims.
20. The method of claim 16 wherein the calculating step includes multiplying each of the plurality of groups representing a medical episode, present for the member,

by a predetermined weight factor and summing the products to achieve a single number.

21. The method of claim 20 wherein the predetermined weight factor corresponding to one of the groups, representing a medical episode, is adjusted based on the presence of a comorbidity for the group, in the data in the plurality of provider claims.
22. The method of claim 20 wherein the predetermined weight factor corresponding to one of the groups, representing a medical episode, is adjusted based on the presence of a complication for the group in the medical claims.
23. The method of claim 20 wherein the predetermined weight factor corresponding to one of the groups, representing a medical episode, is adjusted based on the age of the member.
24. The method of claim 20 wherein the predetermined weight factor corresponding to one of the groups, representing a medical episode, is adjusted based on the gender of the member.
25. The method of claim 20 wherein the predetermined weight factor corresponding to one of the groups, representing a medical episode, is based on the average incremental cost associated with the group for a benchmark population.
26. The method of claim 20 wherein the predetermined weight factor corresponding to one of the groups, representing a medical episode, is based on the average incremental cost for the group during the base period.

27. The method of claim 1 wherein the at least one explanatory variable is a number indicating in which of a plurality of age categories the member belongs.
28. The method of claim 1 wherein the at least one explanatory variable is a number indicating the gender of the member.
29. The method of claim 1 wherein the explanatory variable is a factor that indicates a number of chronic claims for the member.
30. The method of claim 1 wherein the explanatory variable is a factor that indicates a number of chronic drug categories, based on the plurality of claims data, for the member.
31. The method of claim 1 wherein the explanatory variable is a factor that indicates the recency of claims for the member.
32. The method of claim 1 wherein the explanatory variable is the sum of chronic medical costs from the pharmacy claims and the medical claims.
33. The method of claim 1 further including, after the computing step, the step of calculating a relative risk for the member of a group by dividing the score by an average score for the group.
34. The method of claim 1 further including, after the computing step, the step of calculating a relative risk for the member of a group by dividing the score by an average score for a benchmark group.

35. The method of claim 1 wherein a plurality of scores is computed for each of a plurality of members in a health plan.
36. The method of claim 35 wherein the plurality of scores is computed based on only the information from the pharmacy claims.
37. The method of claim 36 further comprising the step of identifying a high risk set of members by selecting the members having scores that exceed a predetermined level.
38. The method of claim 37 further comprising the step of computing a second plurality of scores for the high risk set of members based on the information in both the pharmacy claims and the medical claims.
39. The method of claim 1 further comprising, prior to the computing step, the step of calibrating the model by comparing the computed score against healthcare resource utilization for a known target period.
40. The method of claim 39 wherein the healthcare resource utilization is derived from both medical claims and pharmacy claims.
41. The method of claim 39 wherein the healthcare resource utilization is derived from only medical claims.
42. The method of claim 39 wherein the healthcare resource utilization is derived from only pharmacy claims.

43. The method of claim 1 further comprising, prior to the computing step, the step of calibrating the model by comparing the computed score against healthcare resource utilization for a known target period, for only utilization due to chronic medical conditions.
44. The method of claim 43 wherein the healthcare resource utilization is derived from both medical claims and pharmacy claims.
45. The method of claim 43 wherein the healthcare resource utilization is derived from only medical claims.
46. The method of claim 43 wherein the healthcare resource utilization is derived from only pharmacy claims.
47. The method of claim 1 further comprising, prior to the computing step, the step of calibrating the model by comparing the calculated burden of illness against healthcare resource utilization for a known target period.
48. A method of predicting future utilization of healthcare resources based on readily available information maintained for a member of a healthcare plan, the method comprising:
  - extracting a data set of information relevant to future healthcare utilization from a plurality of provider claims, the plurality of provider claims including both medical claims and pharmacy claims;

placing the medical claims and the pharmacy claims into a plurality of medical episode groups for the member; and computing a burden of illness by summing the products of each of the plurality of medical episode groups present for the member by a corresponding plurality of weight factors.

49. The method of claim 48 wherein the plurality of claims are collected over a time period of about twelve months.
50. The method of claim 48 wherein the pharmacy claims are in the format of National Data Codes (NDC).
51. The method of claim 48 wherein the pharmacy claims are placed into a plurality of therapeutic pharmacy classes.
52. The method of claim 51 wherein the pharmacy claims are placed into medical episode groups by placing the plurality of therapeutic pharmacy classes into the medical episode group to which the pharmacy class most likely relates.
53. The method of claim 52 wherein the pharmacy claims are placed into medical episode groups by using drug-disease matching.
54. The method of claim 48 wherein the plurality of weight factors used in computing the burden of illness correspond to a plurality of costs associated with each medical episode.

55. The method of claim 54 wherein the plurality of costs are determined by calculating the average cost for the associated medical episode indicated by a benchmark claim set.

56. The method of claim 54 wherein the medical episode cost is calculated based on historical claims data related to the medical episode.

57. The method of claim 48 wherein the data subset further includes a first number representing a number of pharmacy providers during the time period, a second number representing a number of physician providers during the time period, a third number representing a temporal recency of pharmacy claims, and a fourth number representing an acceleration of pharmacy claims.

58. The method of claim 48 further including the step, after the computing a burden of illness step, of calculating a future utilization score for the member based on the burden of illness, and an age of the member.

59. The method of claim 48 further including the step, after the computing a burden of illness step, of calculating a future utilization score for the member based on the burden of illness, an age of the member, a gender of the member, the first number, the second number, the third number, and the fourth number.

60. The method of claim 58 further including the step, after the calculating a future utilization score step, of repeating the method for a plurality of members in a group such that a plurality of future utilization scores are calculated, one score corresponding to each member of the group.

61. The method of claim 60 further comprising the step of calculating a relative risk for each of the plurality of members by dividing a member's future utilization score by an average future utilization score for the plurality of members of the health plan.

62. The method of claim 61 further comprising the step of ranking the plurality of members in order by the future utilization score, identifying a set of high-risk members by selecting those with the highest future utilization score, and providing the set of high-risk members to a care management process.

63. The method of claim 60 further comprising the step of providing the plurality of future utilization scores to an underwriting process for consideration in determining a risk-level of the plurality of members in a health plan.

64. The method of claim 48 wherein a second burden of illness score is computed by summing the products of each of the plurality of codes that corresponds to a selected therapeutic class and a corresponding plurality of weight factors, such that the second burden of illness score represents the selected therapeutic class.

65. The method of claim 64 further comprising the step of repeating the method for a plurality of members in a particular health plan such that a plurality of second burden of illness scores are calculated, one score corresponding to each member of the health plan.

66. The method of claim 65 further comprising the step of providing the plurality of second burden of illness scores to an NCQA accreditation process for use

in identifying a set of high-risk members in the selected class and providing systematic improvements in care to those individuals.

67. The method of claim 48 wherein the computing step includes computing a burden of illness by summing the corresponding plurality of weight factors for each of the plurality of medical episode groups, representing chronic medical conditions, present for the member.

68. The method of claim 48 wherein the computing step includes computing a first burden of illness by summing the corresponding plurality of weight factors for each of the plurality of medical episode groups, representing chronic medical conditions, present for the member, and computing a second burden of illness by summing the corresponding plurality of weight factors for each of the plurality of medical episode groups, representing acute medical conditions, present for the member.

69. A method of predicting future utilization of healthcare resources based on readily available information maintained for a member of a healthcare plan, the method comprising:

collecting a data set from physician claims, hospital claims, and pharmacy claims submitted for the member over a prior time period;

extracting a data subset from the data set, the data subset including a plurality of first codes indicating which medications were prescribed for the member during the time period and a plurality of second codes indicating which medical episodes the member was treated for during the time period; and

computing a burden of illness score by summing the products of each of the plurality of first codes and a corresponding plurality of weight factors and each of the plurality of second codes and a corresponding plurality of costs representing the average cost of the medical episode, the burden of illness representative of future healthcare utilization.

70. The method of claim 69 wherein the plurality of weight factors used in computing the burden of illness score are the average costs of the medical episode.

71. The method of claim 69 wherein the average cost of the medical episode is the average cost associated with the medical episode as indicated in a benchmark claim set.

72. The method of claim 69 wherein the data subset further includes a complications field representing any complications experienced by a plan member with respect to a given medical episode.

73. The method of claim 72 further including the step, after the computing a burden of illness score step, of calculating a future utilization score for the member based on the burden of illness, and the complications field, by increasing the burden of illness score for each complication indicated as present in the complications field.

74. The method of claim 69 further including the step of creating a comorbid variable by identifying a plurality of comorbrids that are present for the plan member by analyzing the plurality of second codes, indicating which medical episodes

the member was treated for during the time period, for the presence of each of the plurality of comorbids.

75. The method of claim 74 further including the step, after the computing a burden of illness score step, of calculating a future utilization score for the member based on the burden of illness, and the comorbid variable, by increasing the burden of illness score for each comorbid indicated as present in the comorbid variable.

76. The method of claim 69 wherein the plurality of first codes extracted from the data set include only those codes corresponding to medications prescribed for chronic medical conditions and the plurality of second codes extracted from the data set include only those codes corresponding to chronic diseases, such that the burden of illness score is based only on data relating to chronic medical conditions.

77. The method of claim 71 wherein the weight factor is set equal to zero for all disease classes that do not correspond to chronic medical conditions, and further wherein the each of the plurality of second codes that do not correspond to chronic medical conditions are set equal to zero, such that the burden of illness score is based only on data relating to chronic medical conditions.

78. A method for predicting future utilization of healthcare resources based on readily available information maintained for a member of a healthcare plan using a general purpose computer system including a central processing unit, a memory, an input device, an output device, and a mass storage device containing:  
a number of historical medical claims for a group of plan members,  
a first table for mapping drug codes to GC3 codes,

a second table for mapping disease codes to CCG classes,  
a third table providing the average cost per member associated with  
each GC3 code, and  
a fourth table providing the average cost per member associated with  
each CCG class,

the method comprising the steps of:

- (a) collecting a data set from the historical medical claims submitted for the member over a prior time period;
- (b) extracting NDC codes from pharmacy claims in the historical medical claims for the plan member, mapping the NDC codes to a plurality of GC3 codes by using the first table, and writing to a GC3 data file if the GC3 code is present for the plan member;
- (c) extracting a plurality of medical episode codes from physician and hospital claims in the historical medical claims for the plan member, mapping the plurality of medical episode codes to a plurality of CCG classes by using the second table, and writing to a CCG data file if the CCG is present for the plan member;
- (c) computing a first burden of illness score by using the third table to determine the average cost of each GC3 code present for the member and calculating a sum;
- (d) computing a second burden of illness score by summing the products of the CCG classes and the corresponding cost per member from the fourth table; and
- (e) computing a total burden of illness score by summing the first burden of illness score and the second burden of illness score.

79. A data structure for storing physician and hospital claims data from a plurality of medical claims for a plurality of members of a healthcare plan, the data structure comprising:

- a row for each of the plurality of members of the plan;
- a first column containing a member identifier;
- a plurality of CCG class columns adapted to store a one if the CCG class is present for the member or a zero if the CCG class is not present for the member; and
- a comorbid column adapted to indicate the presence or absence of a particular comorbidity in the CCG classes present for the member.

80. The data structure of claim 79 further comprising a complications column adapted to indicate the presence or absence of a particular complication in the plurality of medical claims for the member.

81. A system for predicting future utilization of healthcare resources based on readily available information maintained for a member of a healthcare plan, the system comprising:

- a first memory for storing historical medical claims for the plan member, including physician claims, hospital claims, and pharmacy claims;
- a second memory for storing a grouping of drug codes, a grouping of disease codes, and a grouping of average cost per member associated with each of the disease codes;
- a processor coupled to the first memory and the second memory, the

processor configured to perform the following steps:

- (a) collecting a data set from a historical medial claims within a relevant time period;
- (b) extracting a data subset from data set, the data subset including the information from the historical medical claims that is relevant to future healthcare utilization; and
- (c) computing a burden of illness number for the member based on the data subset to predict future healthcare utilization of the member; and

an output device coupled to the processor and configured to output the number.

82. The system of claim 81 wherein the processor is configured to perform the identified steps for each of a plurality of members in the healthcare plan and to compute a plurality of numbers, each number corresponding to one plan member.

83. The system of claim 81 wherein the output device is a display device and the processor is further configured to generate display signal associating the number with an identification of the corresponding plan member.